GeniHub™
USB Development Kit
USB Family

EVK3-GNH-100
USB hub supporting four downstream ports with embedded keyboard and mouse functionality

Preliminary

Document Number: DOC3-GNH-EB-100

Overview

USAR's GeniHub™ Developer's Kit enables designers to test their particular input devices for compatibiltity with the USB standard. The kit provides hub functionality, allowing the user to connect up to four USB devices, as well as the on-board keyboard and mouse, to the system. Offering an instant platform for both testing and development, the kit can serve as a reference design or be used for production in its current form.

Developers can also utilize the kit to test their implementation of the USB core in relation to a USB function IC. The Kit comes equipped with a special download board. When changes in the USB or HID specification occur, USAR will update its core HID code to reflect these changes. This revised code may then be downloaded to the Kit board.

Components

USAR's GeniHub™ Developer's Kit comes with two USAR boards: The USB GeniHub™ board (ASY3-GNH-100) and the USAR Downloader board (ASY6-USB-100). In addition, the Downloader board contains a separate jumper cable (CBL-2015-100). Please refer to the diagrams to the right.

Component List
1 - USB GeniHub™ PCB (ASY3-GNH-100)
1 - USB Upgrade PCB (ASY6-USB-100)
1 - Jumper Cable (CBL-2015-100)
1 - Serial Cable
1 - USB Cable
1 - USAR USB Supplementary Software Diskette - Hub
1 - Fujitsu FKB7316-001Keyboard
1 - Dunapro Touch Screen
1 - Touch Screen Stylus

Diagrams of GeniHub™ and Upgrade Boards

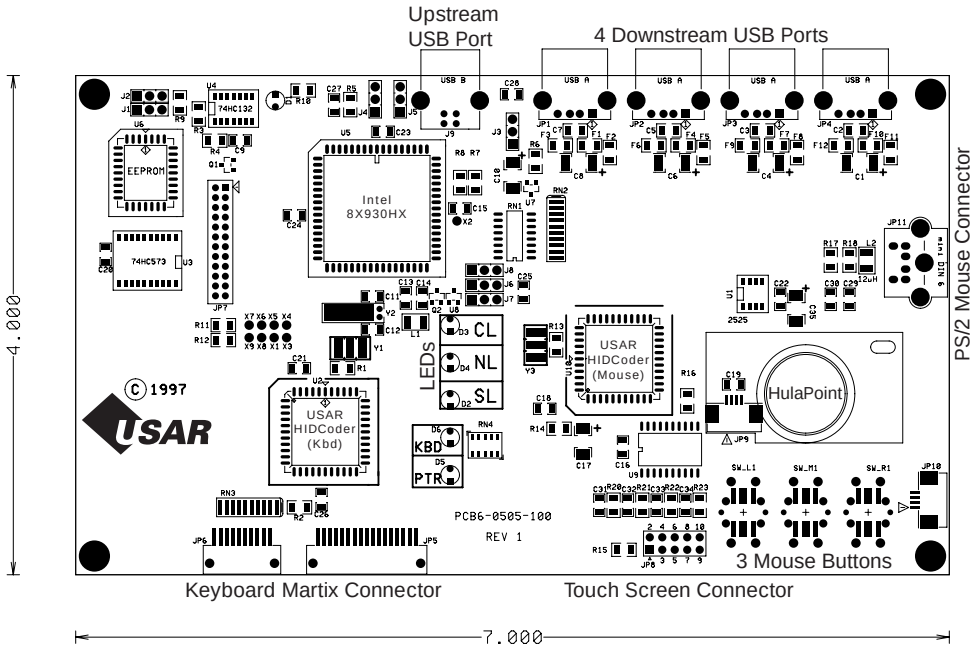

Figure 1: **USAR GeniHub™ Board**

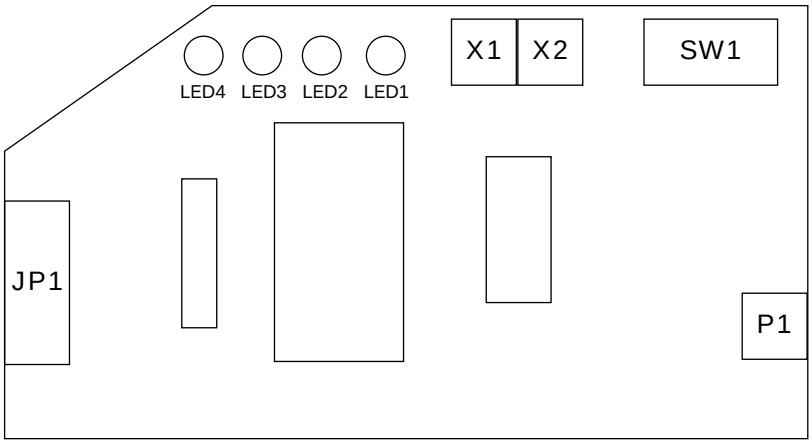

Figure 2: **USAR USB Upgrade Board**

Note: LED1=Ready, LED2=Load, LED3=OK and LED4=Error

Software

For the USAR GeniHub™ to function correctly, the USB host must recognize the device. Included in the kit is a diskette for the installation of the hub. When prompted by the system for the manufacturer's disk, insert the included disk to enable your system to recognize the device.

Enabling USB Support

To activate the GeniHub™, the host PC must be enabled to recognize and interact with USB devices correctly. First, the host PC's USB Root Hub must be properly configured. To check this in Microsoft Windows, go to Control Panel > System > Device Manager. Under "Universal Serial Bus Controller" there should be a USB Root Hub. If the device is present with no errors, the host will recognize USB devices correctly. If there is an error, refer to your operating system documentation, or contact Microsoft for support.

Enabling HID Support

HID support must be installed correctly for the USAR GeniHub™ Board to work properly. In Microsoft Windows, the following files must be placed in the Windows system directory (usually c:\windows\system). They are: hidclass.sys; hidusb.sys; kbdhid.sys; mouhid.sys; and hidparse.sys. All are available on the operating system CD-ROM or the latest Microsoft Windows WDM DDK.

Connecting

Powering
There are two modes in which the GeniHub™ may operate. The first is powered by the USB. The second is powering the Board through an external power source.

USB Powered
To power the Board through the USB connector, Pins 1 and 2 on J5 must be connected with a jumper.

External Power
To power the Board through an external source, attach Vcc to Pin 2 and ground to Pin 3, both on J5.

Turning the Power On / Off
Switch J4 controls the source of power to the Board. In the Off position, power is no longer supplied and in the On position power is supplied to the Board and LED D1 will light. On is indicated by moving switch J4 toward the Intel 8X930HX chip.

NOTE: Under certain circumstances the USB device will power itself down. This will be indicated by LED D1 turning Off. For further information see the USB specification version 1.0.

Using the Mouse
After the power is turned on, allow the mouse three seconds to seek its origin before moving or using any external or on-board mouse.

Mouse Connections
The Developer's Kit provides two on-board USB pointing devices: the HulaPoint™ and the touch screen. The touch screen is connected at JP8. The output of these two devices is merged. The kit also provides a PS/2 port, at JP11, for an external PS/2 mouse device. Data from this device will also be merged with the on-board mouse data.

Keyboard Connection
The USAR GeniHub™ board allows one keyboard connection through a key matrix. A matrix can be connected through JP5 and JP6.

JP6 is designated for the rows and JP5 is designated for the columns of the matrix. Both sets of pin connections must be aligned properly for the matrix to function. The eight pins for JP2 should be right aligned, and the 17 pins for JP3 must be left aligned in the connector.

Hub Functionality
USAR's GeniHub™ is a full-feature bus-powered hub. Up to four devices can be connected at its downstream ports, located at JP1 to JP4.

USB Cable Connection
A USB cable is required to connect the Board to the host or hub. The upstream receptacle on the USB Board, J9, should be attached to the Type B connector of the USB cable. The Type A connector of the USB cable is attached to the downstream port of the host or hub.

NOTE: The USAR USB Board supports the power management features of the USB specification. Part of this specification requires that the device power down upon receiving a suspend command from the host or after 3 mS of inactivity on the bus. Users will not be affected under normal conditions. For further information see the USB specification version 1.0.

USB Firmware
USAR's GeniHub™ Developer's Kit comes pre-loaded with the most recent version of the USAR USB firmware. The Kit also comes with an Upgrade Board to enable users to quickly and easily update the USB Board with the most recent version of the USAR USB firmware. USAR will make modifications to remain compliant with the USB and HID specification. Any changes in the firmware will be available for download on the USAR USB Board.

The Upgrade Board need only be connected for a downloading operation. After the new firmware has been successfully installed, remove the Upgrade Board. Once removed, the board will once again behave as a hub.

Downloading

IMPORTANT: Before connecting the Upgrade Board, make sure that the GeniHub™ is not powered. To accomplish this, turn off switch J4.

Align the USAR Upgrade Board connector JP1 with JP7 on the GeniHub™ Board. The backside of the Upgrade Board should be facing the Intel 8X930HX chip. Connect the serial cable to the serial port of the PC containing the downloadable firmware.

Next, make sure that Switch SW1 on the Upgrade Board is in the download position (up). The jumper cable supplied with the Kit should be attached to Pins X1 and X2 on the Upgrade Board and Pins 1 and 2 of J2 on the GeniHub™ Board. Turn the power on (Switch J4). If the hardware is correct, LED D1 on the GeniHub™ board and LED1, "ready," on the Upgrade board will both be lit.

WARNING: Never remove or attach any connections between the Upgrade Board (JP1 or X1 and X2) and the GeniHub™ Board, nor toggle switch SW1, while power is on.

Once the hardware has been correctly configured, the firmware can be downloaded. The firmware is supplied as Intel Hex Code. The serial communication must be set to 19200 baud, 8 bits, no parity and 1 stop bit. In Windows, open the HyperTerminal program and establish the settings above. Using the Transfer menu, select "Send Text File" (not "Send File") and specify the file containing the USAR firmware when requested.

While the firmware is being downloaded, LEDs D3 and D4 on the GeniHub™ board and LED2, "load," on the Upgrade board should remain lit if the download operation is working properly. At the successful conclusion of the download, LED D3 on the GeniHub™ board will repeatedly blink and LED3, "OK," on the Upgrade board will be on. These are an indication that the firmware has been transferred correctly.

After the firmware has been successfully downloaded, power down the GeniHub™ Board (Switch J4) and remove the Upgrade Board and jumper cable.

If LEDs D3 and D4 on the GeniHub™ board blink during the transfer, an error has occurred. LED4, "error," on the Upgrade board will also be on. In this instance, power down the board, check the serial connections, the cable connectors, and the settings of the communication software and repeat the downloading process.

Mouse Operation

Overview

When using the USAR USB mouse in conjunction with a regular PS/2 mouse attached to the PC's PS/2 port, the PS/2 mouse will not necessarily exhibit its normal behavior. In particular in OSR2.1, when trying to click and drag with the PS/2 mouse, the mouse may have the effect of double-clicking the object. This is due to the mouse driver having to multiplex the regular PS/2 mouse data together with the state of the USAR USB mouse. For click and drag operations, use the USB mouse for best results.

Touch Screen Functionality

The Kit includes a stylus to use with the resistive touch screen. The touch screen acts like a mouse. The cursor will follow the movement of the stylus as it is moved across the touch screen. Clicking action can be achieved by tapping the touch screen with the stylus.

Functional Layout

Functional Blocks

USAR's GeniHub™ Developer's Kit is essentially composed of three basic building blocks: the USB Unit, the Key Scanning Unit and and the Motion Scanning Unit.

The USB unit consists of the Intel 8X930HX core with USAR firmware and handles USB communication, data processing, and power management. The key scanning unit consists of the USAR USB HIDCoder for keyboard input and handles the scanning of keystrokes from the key matrix.

The motion scanning unit consists of the USAR USB HIDCoder for motion input and handles the scanning of motion from the on-board HulaPoint™ and Touch Screen, as well as from the external PS/2 mouse. The functional block diagram is shown in Figure 3.

Communication

The three functional blocks communicate data using a USAR-defined serial protocol. This allows the USAR HIDCoders to transmit the scanned data to the USB block reliably, using the popular RS232 framework.

The protocol for keystrokes is defined as follows:

- For a key press, the encoder transmits the USB code corresponding to that key.
- For a key release, the encoder transmits the USB code prefixed with a control byte.

The protocol for motion is defined as follows:

- For any update in position or button state, the HIDCoder transmits a four-byte packet with current button states and the relative motion that occurred.

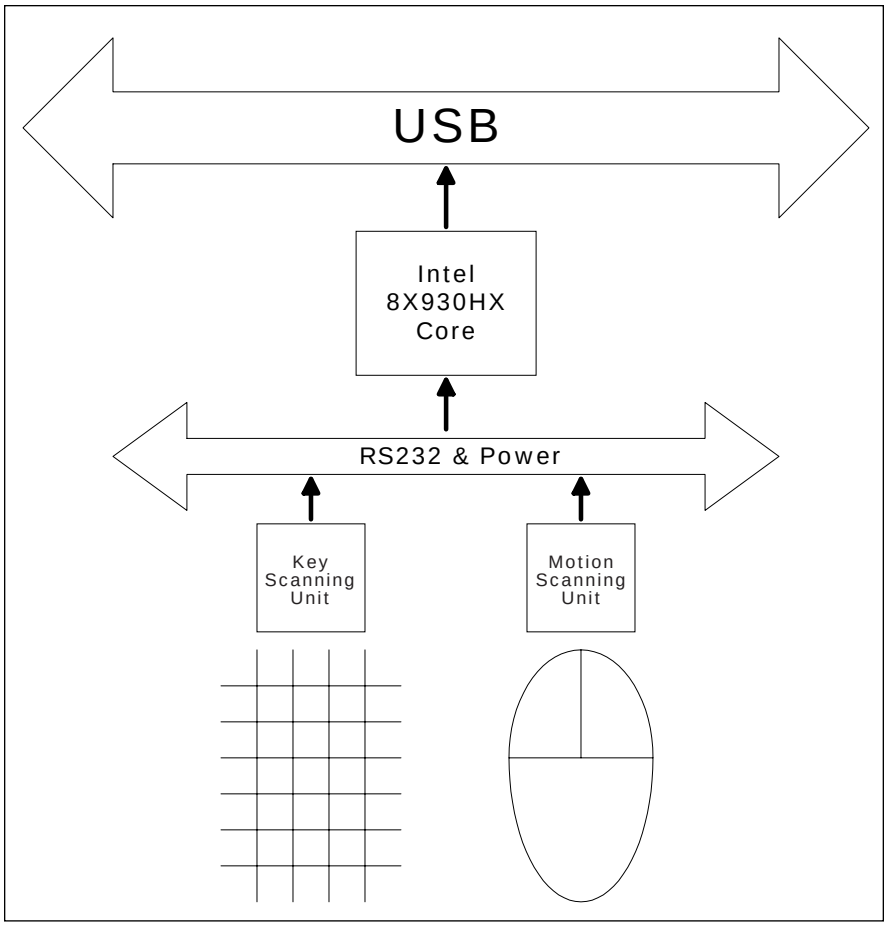

Figure 3: **USAR GeniHub Developer's Kit Block Diagram**

The HIDCoders handle contention for use of the single serial data line to the USB unit, so that the data messages are interpreted correctly. Furthermore, a slightly more complex communication scheme is used for all the blocks to handle power management reliably. This allows the system to both conform to the USB power specification and still not miss any user action, be it a key press or mouse movement, that occurs.

Key Map for Fujitsu FKB7316-001

Rows (R0–R7) \ Columns (C0–C15)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0				Space	B				N		FSlash		RAlt	ArDn	ArRt	ArLt
1		Esc	F4	F5	G		F6		H		RQ		LAlt			ArUp
2		Tab	F3	BkSp	T	CapLk	RSB		Y	LShift	LSB	F7				
3	PgUp	LQ	F2	F9	K5	F1	Equal	FN	K6		Dash	F8		Del	Ins	Home
4	LCtrl	A	D	BSlash	F	S	K		J		SCol	L				
5		Z	C	Enter	V	X	Comma		M	RShift		Period		NmLk		Pause
6	PgDn	K1	K3	F10	K4	K2	K8		K7		K0	K9	PrtSc	F11	F12	End
7		Q	E		R	W	I		U		P	O	ScrLK			

For More Information

For more information, please consult our web site, http://www.usar.com, and review the section on USB. For technical support, contact our technical support staff by e-mail at **usbinfo@usar.com**

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